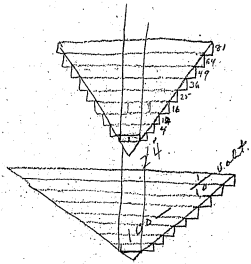
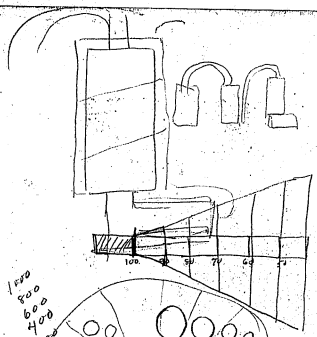
Notebook, N-01-03-05

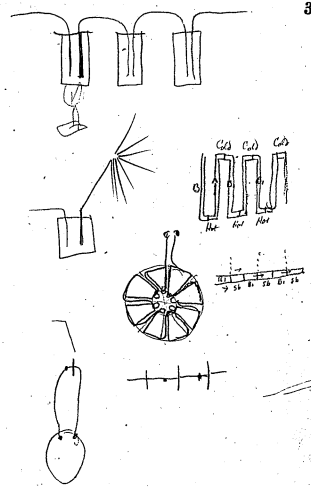
This notebook contains dated entries from March 1901. All entries are by Edison. Included are notes and drawings relating to storage and primary batteries and thermocouples. The book contains 292 numbered pages. Many pages are blank; pages 281-282 have been removed from the book.

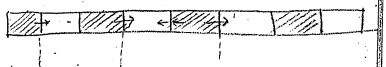


80 | 1000 | 12.5
80
200
200
4

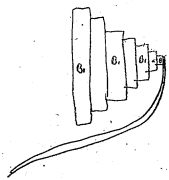
ARTHUR & JOS. NEALE
MANUFACTURERS
56 CEDAR STREET
NEW YORK







D_1


G_2
G_1
D_1

Stannous oxychloride formed from oxide of Stannous Chl – this is what makes $SnCl_2$ a reducing agent as O is absorbed avidly

Stannic Chl is a solvent for many bodies both Organic & inorganic

Stannic Ox – Insol in Di Carb K forms hydrated Ox –

1 Carbonates & other Crystalline salts of filament
2 Thermopile
3 Various Electrolytes
4 Depolarizers for delivery
5 " " Storage
6 Organic storage
7 Peroxides
8 Conducting Salts (dry)
9 Carbonate Storage Electrolyte
10 Alkaline Solutions
11 Molten Compounds for direct Coal battery
12. ~~Alkaline~~ Reducing agents Organic
13 Reducing agts Inorganic
14 Oxdg agts Organic
15 " " Inorganic
16 Concd Organic alkalis

Titanous Chloride extremely powerful.
depolarizing agt —

To test Organic depolarizers. —
use Charcoal plates soaked in
the Chloride or Sulphate of the
Organic base — & test against
say Fe

Try Titanous K on Charcoal plate
& pp hydroxide by acid —

Benzylamine — Liquid boiling 182 Cent
Sol water all proportions, but is
~~Deposited therefrom~~ By KOH
absorbs CO_2 rapidly. Its a.
strong base — an impure salt
might be made cheap

Sulphurous Hydroxyltriethyl or Hydrate of Triethylsulphine — Watt
a-Reg 882

Strong alkaline Sol - quickly absorbs CO_2 for min precips salts like KOH
precips Cu & Zn to hydrates insol in excess —

Propylamine - very sol H_2O. sol
precips oxides Fe Cu Pb Al Ni Co
Hg does not dissolve them in excess

Phosphide Tungsten good Conductor Elec - difficult Oxidize
not attacked by any acid
not even aqua regia - dont
ox at red heat, W_4P_2

p011 = Matter Key —

Make a Moissan furnace to form alloys for Thermo —

Valeric peroxide — action Barium Perox on Valeric anhydride — heavy oil acts oxdg ngt when suspended H_2O

Vanadium Dioxide V_2O_2
Conducts ~~Electricity~~ difficult to fuse Spec g 3.64
burns when heated red-hot
Insol in H_2SO_4 HCl & Hydrofluoric
Sol aqua Reg —

Drox in Sol absorbs Ox more rapidly than any other known reducing agent — its made

by action Nascent H from
Zn Cd or Na amalgam on
Vanadic acid or Sulp Acid
passing thro all shades to an
Lavender — The Sal absorbs
O as readily as alkaline pyrogallate

Vanadium Trioxide V_2O_3
or $V_2O_2 \cdot O$
Conducts Electricity — infusible
when Exposed warm to the air
it glows & oxidizes to pent ox
its insoluble in acids

Vanadium should be worked
with an acid Sal
also Carbonate alkali
etc —

Mch. 5 1901-

Solution of Mercury in KOH. —

when Sol of Mercuric Chl is added slowly to mix of acetone with dilute KOH the HgO is 1st precip then dis to clear liquid —

Solution gelatinizes on ebullition or Lowes acid - by hydrolysis the KCl etc goes out leaves a resinoid sub when evap

$2\,Co(CH_3)_2\ 3HgO$ — Watts 2nd Sup 13
turning gelatinous solid from 5% up

Several Ketones of fatty acid do same thing

Alkaline Sulphites is a great agent for forming Compounds with Organic Materials —

Redog agt Aldol

Aluminum Separates Zn as metal from alkaline Zn Solution

Mch 5 1901 J.A.E.

104 - Anthraquinone - anthracene is oxd to " "

Phenanthrene ox to phenanthraquinone - by gentle oxd'n -

Oxide Sb insol - NaOH, forms Na antimonate & is used to test alkalies might use NaOH & antimony with N_2O_2 as depolr - KOH would do

It is possible that this will make a good storage battery

Antimonate of Na is insoluble - Its forming & tried KOH the antimonate of which is sol -

Amidobenzene - sol H_2O strongly alkaline - Cheap & think

* Mch 5 1901 TOE

Butylamine - Strong Alkali oxides
metal are pb. al. mg. Cu, Ag
but ag Cu - apparently al oxides are
Dal in Excess "

Isobutylamine. or Tetrylamine, described
under later name

according to Bunsen the density
of the Current Controls the products
of Electrolysis with a certain
electrode having small surface
+ placed in Deg n. Chloride
Chromium deposits Chromium
if surface gradually increased
we get Chromous ox. Chromic ox
Much Hydrogen — This is important
in alloy with depolarizers

Bi Cubic

Ag – Cubes – sometimes forms of octahedron

Zn – brittle cold soft 100 @ 150 C + brittle 210 C

Pt Cubes octahedrons

Pd Crystal tables colour octahedron

P Reg octahedrons or rhombic dodecahedrons

Sb Rhombohedral Crystals Lamellated structure fern like crystal

As – rhombohedrons, isomorph with Te + Sb

Zn Hexagonal green lamellar structure,

Ag – Reg octahedrons

Cu " "

Pb " "

Te Cubes by Phosphorogen + ~~pos~~ quadric octahedron by Selenophosphates –

Sn – needle shaped prisms or tabular crystals.

Zirconium Scales like Sb –

Di – Obtuse rhombohedrons which appear like cubes

Au Octahedron tetrahedrons

S – adhedrin rhombic system, 30 different forms

See page 26

Yehni	Becquerel	Cumming	
Bi	Bi	galena	Cubes
Ag	Pt	Bi	Cubes
Pt	Pb	Hg + ni equal	
Au	Sn	Pt	
Au	Au	Pd	
Sn	Ag	Co	
Pb	Cu	Ag with Cu	
X	X	Sn	
Zn	Zn	Pb	
Fe	Fe	Brass	
Sb	Sb	Rd	
		Au	
		Cu	
		Os Ir	
		Ag	
		X	
		Zn	
		Charcoal ×	
		graphite –	Microcrom Cry
		Fe –	
		Arsenic –	
		Sb –	

There is probably Errors here – by substituting or running lines most probable in

Bi	Zn
Pt	Fe
Sn	Sb
Pb p	
Au	
Cu	
Ag	

See Matthiessen Proc Roy Soc IX 98

Se – Isomorp with monoclinic form of sulph

I_2 Rhombohedric —

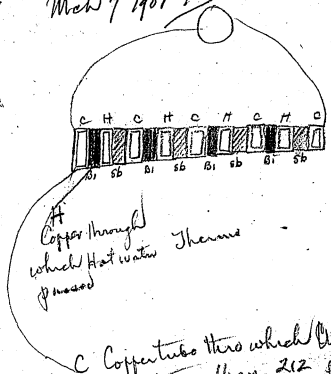
Phos Rhombohedrical – plates, Rhombohedrin

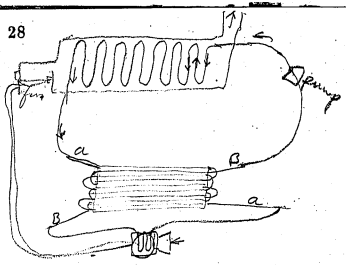
Boron Monoclinic octahedra

Si octohedron & tetrahedron

Graphite. Monoclinic or as mineralogy chem disposed

Mch 7 1901 TAE





March 7 1901 TAE

For Thermo Expts –
Sulphides ~~Cop~~ of the metals that conduct
" Molybdenum
— Iodide Copper –
peroxide Lead
$Ni O_2$ —
perox manganese
Spegelessen –
Manganin – also the other lately discovered Rare metals of like character –
Nitroxyamide of titanium
Nitrides of the metals
Double Sulphides of the metals
Phosphides of the metals
Tellurides & Selenides of the Metals
Arsenides of the Metals –
alloys of Sulphides, phosphides
Tellurides Selenides & Nitrides

Scale oxide —
magnetite —
Alloys of metals with one another
also complex alloys —
graphite,
Amalgams —

Solvents which produce
Ionization, Water The alcohols
Phenols Esters, Ether & Acetone
All are of the Water Type
Except Acetone —

The solubility of one salt
is diminished in water when another
salt having an Ion in common is put in

In order to precipitate a sub
completely an excess of the precipty
sub must be used.

Hoyer proved that the solubility
of a salt increased when
another salt was added
having no Ion in common

When solution ZnChloride ~~also~~
spec g. 1.7 is boiled with
excess of Zn oxide liquid is formed
which dissolves silk —
perhaps this will dissolve
grizzle-horn, sea weed horn or coral
to make a solid bone by
running into alcohol like
fulminate —

If 2 molecules Boron trioxide
3 molecules lead oxide be fused
together a yellowish soft
glass is obtained which
Softens in Hot Oil =
phono records. " " —

Cyanide Pb is used in alkaline
Cyanides — Why will it not
work as storage bat in
KCy solution

If 100 pts. Galena & 84 pts. metallic
lead heated 1/4 hour in well
closed charcoal crucible — wind
furnace 144 pts of a dull fine grained
semi malleable soft mixture obtained Pb_4S if carried on in Hermetically sealed
Pb_4S with Borax Pb_2S obtained

Evidently many alloys of Pb + S can be obtained thus as well as other metals with Pb + S. for the same to disappear

Bi —

Cuprous chl melts below red heat

Exposed to air forms oxychl

Leland Caprie oxychloride

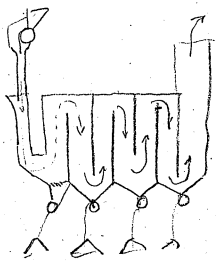
Insol KOH, ~~form~~

It is evident that an enormous number of alloys composed of any subsulphides of various metals one with another can be made also more S or sul + higher sulfides

also phosphides

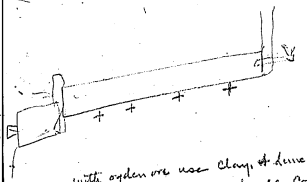
Silver is not attacked by fused alkalies —

Mch 8 1901
TAE



Signing for Cowles process

Cerium forms Ce_2O_3 & also CeO_2 which is powerful oxidizer — gives it another trick with Carbon Electrodes —



with ogden ore use clay & lime which with iron makes very fusible Compound that will gob together — or heat can be regenerated probably Cheaper than Coal tar process — breaking —

See if ogden ore frits together at yellow or what temp etc.
put man on brick by heat alone

Thermo — Iodide of Sulphur Di Sulphide
" Disulphide of Selenium Exhibits Metallic luster
" I have read somewhere that Red amorphous phos is the highest & most powerful B.V. and Thermo known but Res is very high — but with new ~~[illegible]~~ & cd be made low enough —
Schrotter — Says its Conducts Elec — is hard as Calc spar spec g 2.1 unalterable in the air & only takes fire when heated to 240 Cent —

? There is another form of phos described in Schlomm Called Metallic Phos

It is made by heating phos in
sealed tubes — Contact with
Metallic lead to temperature
approaching red heat
for 10 hours on cooling
whole mass lead permeated
with crystals to separate
these lead dis by dilute
Nitric acid crystals
further purified by
boiling in strong HCl —
Metallic P is brightly lustrous
dark crystalline Mass colour
in thin plates has red color
Spec g 2.34 it conducts
Elec better than Red P
it stands Temp 358 Cent
before it reverts to ordinary P

This variety is also formed when amorphous P is heated under pressure to temp of 580° Cent.

Telrametaphosate of Metals are viscous, Elastic masses gums

There are Sulphides of P (Solid)

Dry Copper acetylide Lelande —

Manganites — Lelande, Manganite of Calcium — made by adding Metal Mn to Solution Bleaching powder

Weldons process

Manganous hydroxide is completely transformed into Mn dioxide by air heated to 55° Cent when an Excess of lime is present,

~~[illegible]~~

Lehmann - Case Manganate Barium boiled + raised to $BaMnO_2$ -

To Coat iron with preservative Coating of the Black Magnetic Ox Becquerel places the iron as pos Electrode in Sol of Sul Iron + Sal Ammoniac + does it electrically

Storage = Fe_2O_3 is reduced to FeO by passing Hydrogen over it — if exposed to air takes fire but if Hydrogen is passed over it for 12 hours it does not Catch fire — Its Black

If Ferrous Oxalate is added to a boiling Sol of KOH FeO is precip as a black ox — if washed with water it oxidizes perhaps could press out excess of KOH, get it dry enough to press — or use alcohol etc

Try

Iron Nitride is so soft it
Can be cut with a knife
its magnetics = oxidizes very
Easy in the air — Fe_2N —
How about this for storage,
Spec 9 6.03 — The N going
off would leave it porous
+ O would take its place
without swelling —

Iron - Nitroso - thiocarbonate
formed when Nitrite Soda +
Na Thiocarbonate are added to
Sol of Ferrous Sulphate,
Can be recrystalized from Ether
black prisms, Sol in alcohol +
Ether not attacked by acid
or Alkalis

See from Nitrosulphide Fleming

Chromous Chloride powerful reducing agent –

When KOH is added to a Solution of Chromium Salt & a Salt of Magnesium a precip obtained of the 2 which must be in excess of alkali – Battley US CrO_2K_2 KOH & a magnesium Salt to keep Cr from dissolving

When vapor of chromic Chloride passed thro red hot tube Cr_2O_3 = $2Cr_2O_3 + CrO_3$ obtained

Magnetic – Amer Chem + Phar – C & V VIII 61

Chromyl Chloride, or
Chrom Oxychloride —
in acetic acid acts as powerful
oxidizer on Hydrocarbons

Molybdenum Tetrasulphide forms,
Compounds with many metallic
Sulphides — Called Pen Thiomolybdates
(alloys?) — HCl throws down
from the solutions a red precip
which dries to a mass having a
metallic Luster —

When antimony is precip by Zn
from a Sol of the Trichloride
metal is obtained finely divided
state. as antimony black — used to
give plaster paris articles appearance of
steel or iron —

Singular Compounds of Tungsten
Employed as Bronze producers

Tungsten K Bronze, dark blue needles
Copper color
produced a current thru fused
polytungstate K — gives deep blue
Copper color Cry not attacked by
KOH —

Tungsten Sodium Bronze
obtained when Polytungstate Na
is fused with Tin & mass heated
with NaOH & HCl — golden Cubes
Spec g 6.617 Conducts Elec well
on ignition oxidizes in air & fuses
not attacked by alkalies or any
acid Except Hydrofluoric

Zn Fe Sb & Bi all expand on cooling they are also the best Thermo metals

Bi Pt etc Pos Elec goes from Cold piece to hot piece & in Hg rotates ↑ from
Zn Fe Sb from Hot to Cold —

Conductivity of fused Salts. Braun (Pogg Ann Clx 161) Conductivity in vicinity of melting points of Hg at 0° cent to 1,000,000 at 632 H2SO4 sol 7.700

Non Pb Cl2	32 200	K2CO3	2150
Na NO3	11 470	ZnCl2	85 ? ?
Ag NO3	8 658		
NaCl	8660	Water Solutions have generally a lower Res except in Cases	
KNO3	6500		
Na2SO4	3680	ZnCl2 colloidal & extraordinarily low —	
SrCl2	2260		

Solid Tellurium has a resistance 500 times greater than silver

Cryolite melts below a red heat

Tetraoxide of Antimony melts below red heat

Melting Points

AsI_3	146 Cent	$KClO_3$	359
Borneand	186	PbI_2	383
$HgBr_2$	242	$ZnBr$	394
$LiNO_3$	267	CdI_2	404
SbF_3	292	$Ba(ClO_3)_2$	414
$NaClO_3$	302	$AgBr$	427
$NaNO_3$	316	Cu_2Cl_2	434
KNO_3	339		

Melting Points

LiI	446	LiCl	598	KF	789
ZnI_2	446	Cu_2I_2	601	$PbHPO_4$	800
AgCl	451	$NaPO_3$	617	LiF	801
$CuCl_2$	498	NaI	628	$BaBr_2$	812
$PbCl_2$	498	$SrBr_2$	630	Na_2CO_3	814
$PbBr_2$	499	CaI_2	631	Li_2SO_4	818
SrI_2	507	KI	634	$SrCl_2$	825
CdF_2	520	$Sr(NO_3)_2$	635	K_2CO_3	834
AgI	527	$CaBr_2$	676	Na_2SO_4	861
$CdCl_2$	541	Li_2CO_3	695	Li_3PO_4	857
LiBr	547	$MgBr_2$	695	$Na_4P_2O_7$	888
$Cu(NO_3)_2$	561	KBr	699	NaF	902 a
$Na_2B_4O_7$	561	NaBr	708	CaF_2	902 a
$CdBr_2$	571	$MgCl_2$	708	SrF_2	902 a
$Ba(NO_3)_2$	593	$CaCl_2$	719	BaF_2	908 a
B_2O_3	577	KCl	734	Cu_2F_2	908 a
		ZnF_2	734	MgF_2	908
		MoO_3	757		
		NaCl	772		

The rate which heat travels along a bar of iron at any point increases proportional to the square of the distance from the source of heat. Heat Conductivity of Fe not affected by the addition.

Gutta percha of all liquids water is the best conductor of heat.

Certain Ethers & Ethylene bromide amyl iodide & Ethyl iodide the worst

Specific heat Metals –

all below 08

Antimony – 049 @ 052

Arsenic 082

Bismuth ·0305 –

Cd 054

Indium – 057

Lead ·031

Silver 055 –

Tellurium 047

Tin 054

Above

Zn 093

Fe_2 0·112

Al 0·202

C ·201

Mg ·245 –

Cu 093 –

Spec. Heat Compounds

Below 0.·100

HgO ·053	AgCl 089	
PbO 053	$BaCl_2$ 090	
SnO_2 089	$HgCl_2$ 064	
WO_3 ·089	$PbCl_2$ 069	
Sb_2O_3 092	NaI 088	
HgS 051	$PbMoO_4$ 082	
PbS 049	$PbSO_4$ 082	
	PbS_2O_3 092	

High

$MgAl_2O_2$	·312
B_2O_3	·234
Cu_2S	·120
Cu_2Fe_2S	·131
FeS_2	·126
Fe_3O_4	·156

Expansion metals

Cd	0094
Zn	0089
Pb	0083
Tin	0068
Ag	0058
Cu	0049
Au	0044
Bi	0039
Palladium	0033
antimony	0031
Pt	0026

The table probably wrong

alloys expand diff—
for instance 58 Cd 42 Pb - 0091

The Conducting power of liquids increase with the temperature

Water Conducts about 110 times worse than Copper if its not agitated

2/17/97

Conducting power metals

		others relative
Ag	100	
Cu	73	
Au	53	
Brass	23	
Zn	19	
Tin	14.5	
Fe	11.9	
Pb	8.4	
Pt	8.5	
German Silver	6.3	
Rose fusible metal	2.8	
Bismuth	1.8	

Wiedemann & Franz
guz best list
Pogg An lxxxix
497

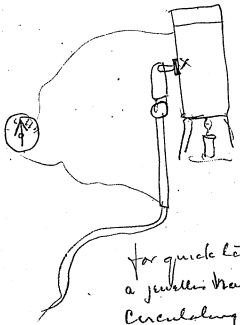
Easily fusible Iron alloy
79% Fe pig. 19.5 Tin 1.5 Lead

Ferric oxy prepared from oxalate when heated
1/2 hour in H. reduced to Mag ox
if heated 20 min to 500 it gives pyrophoric
Fe_2O_3 = if kept 12 hours in H (see book in back)
it is non pyrophoric

Compound of Ferric ox with Lime

Mix of 190 pts Fe 66·5 Lime
heated to white several hours in
Platinum Crucible standing on a
muffle - Mix left to Cool
slowly - Crystl with long-blade
magnetic Istill larger Crystl
obtained by igniting 1000 grains
Hematite with 1000 grains Chalk
Spec g 4·69 - Percy Phil Mag
(4) x lv 455, it may conduct or
act as Thermo

Melted Magnetite would probably
Conduct & act as thermo -

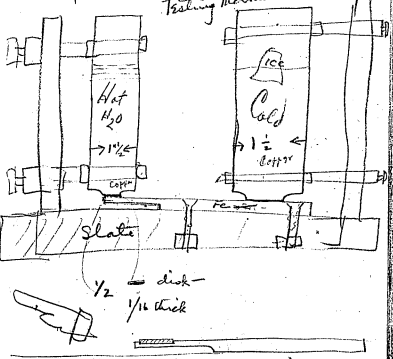


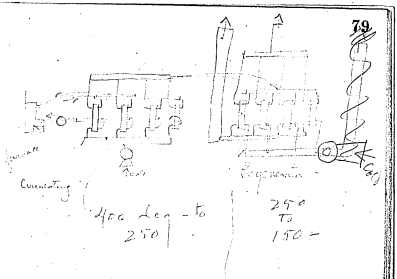
for quick tests use a jeweller's hand vise with circulating water jacket & clamp the piece & touch the hot cylinder which at X contains silver in place

As Bi Te Selen (photo cryst) seem to be the best P metals &

Zn Cr Sb the best N metals for Thermo & are all are highly Crystalline, it seems to prove that the power is related to Crystallization

Testing thermo

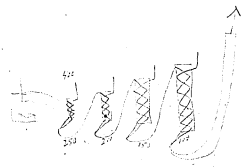




Isourethane CH_4ON_2 alkaline -

Urea has no alkaline reaction yet combines with acids -

Guanidine CH_5N_3 powerful Base absorbs CO_2 from air -



Measure depth of the inside of tube in mm at each measure

Some of the iron alloys can be made with are light in Crucible Crystals we have got

Carbon Bisulphide is an O×4 Conductor —
hence KOH in strength to be electrolyzed —

Sulphuric is liquid — an insulator Chloride —

at 18 Cent. following gas best Conductors
1st being Epsilon on

NH_4Cl KCl NaCl LiCl $CaCl_2$ $SrCl_2$
$BaCl_2$ $MgCl_2$

Max conductor below saturation as shown by
$CaCl_2$ $MgCl_2$ & phy. rich. with the others the
Conductor increases exactly in proportion to
Concentration,

Worst Conductor Chloride to $BaCl_2$ 6 best NH_4Cl
which in 2½% sol Conducts 1/2 as well as
best Conductor and 4½% saturated at 100 C
Conducts as well as acid —

All above increase Conductor uniformly
with rise of temp —

Res of Selenium decreased like C by
heat at 60 it has 6 times higher Res
than at 200 Cent

Ethyl Sulphite $(C_2H_5)_2SO_3$ —
Mobile liquid boils 161 Cent. burns
with difficulty —

Diethylsulphuric $(C_2H_5)_2SO_4H$,
deliquescent strongly acid salts attack
Other bases KOH decomp. NH3 salts
precips. salts of metals & Ammonia
ca(Hydroxide) — Ammonia —

Diethylamine $N(C_2H_5)_2H$
Zinc hydrate absolutely insoluble
in H2O. Very as base (Equally
soluble in water) — B point 57C

Triethylamine metal precip. not
soluble BP 91C

Tetraethylammonium Hydroxide — $N(C_2H_5)_4OH$, Very caustic alkali reactions closely resembles KOH. Easily f. Chromium Sulphate is insoluble in excess

Tetraethylstibonium Hydroxide — $Sb(C_2H_5)_4OH$, Hydroxyl alkaline —

Tin triethyl Hydroxide. $(C_2H_5)_3Sn.OH$. Very alkaline Solution Boils 272 — decomposed fire —

Propylamine — precips Salts Fe Cu Pb Al Zn Co Ag Hg of these Al & Ag Oxl in excess

Tetrapropylammon Hydroxide Eq. alkali

When Sb Hydride is passed thro' KOH, black powder or rather brown is formed Is $Sb(OH)_3$ Leland? it decomposes on standing —

Sodium Metaantimonate is the only insoluble salt of Na

Most metals + their alloys Crystalize in Cubic form but Sb Bi Zn Crystalize in Hexagonal system —

Chlorohydrins, have HO —

Ethylene Chlorohydrin $C_2H_4Cl.OH$.

may be useful as Et. chlorhydrin

glycerine $C_3H_5-(OH)_3$ is an alcohol —

Ethyl alcohol -

Then glycol

Then glycerine -

The amido acids are perfectly neutral, they combine with acids & having one H atom which can be replaced by a metal - Amidoacetic acid is one —

Hexmethylenamine $(CH_2)_6N_4$ —
is alkaline —

Glycol — Ethylene Glycol is a colourless
$C_2H_4(OH)_2$ liquid like syrup boils 197 C
dissolves in Water in all proportions
it dissolves various salts in small
quantities Especially Chloride
KCO_3 KOH & Lime — Oxidizes
to glycolic acid $CH_2(OH)CO_2H$.

Ethylene Oxide C_2H_4O.
Boils 13 C. dissolves in water all proportions
it has a neutral action yet acts
as a very strong base & forms a
"Link" bet Organic & General Chemistry

It acts with Cu + other salts

Ethylene Mercaptan forms insol
" Mercaptides — sol alkalis

Ethylene-diamine strong alkali
boils 117-C

Ethylene oxide Combines with
aq NH_3 with production
heat Oxyethylamine
Di oxyethylamine
Tri " "

all powerful alkaline bases

Organic Alkalis are obtained as free
base by action AgOH on chloride of the
base

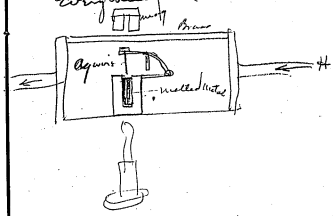
Choline - strong alkali
Neurine " "

Aldehyde ammonia very feebly alkaline —

Manganese Dioxide dissolves in solution of Calcium Hydroxide in glycerol yielding a red color can be got into solid state = Lakdanke —

In Thermo Experiments ~~[illegible]~~ the Emf series already determined varies much it is evident that bad contacts & oxidation has been disturbing factors — Hence better put the metals in tube & melt the material in Hydrogen & have a silver

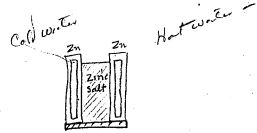
were just out of it so when the tube is heated in Hydrogen Everything is reduced —



Amorphous Sb by Electrolysis passes suddenly into Crystalline state rising from 60 Fahr to 450 Fahr — ~~so~~ specific heat of amorphous Vanadium .0631 after discharge .0543 cooling out .0508 The total heat given off in the change is sufficient to raise its own weight about 650 Fahr

above takes place when heated or struck suddenly

Silicon can now be made
Cheap as aluminum is cheap
Silicon melts ~~for~~ great
above Boiling point of
Zinc & can be cast in
Sticks



Non polarizable Electrodes in solutions
of their own salts for Electrolytic
thermo pile - plates from one
to the other (1e) Hot to Cold
then water reversed & plates
back =

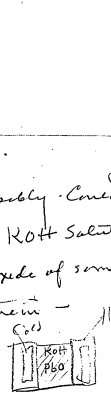
Following Cells made that way

Zn	Zn KCy	Zn
Zn	Sul Zn	Zn
Zn	Chl Zn	Zn
Zn	Nit Zn	Zn
Zn	acetate Zn	Zn
Zn	KOH. Little ZnO	Zn
Sb	Salts of Sb	Sb
Pb	"	Pb
Fe	"	Fe
Ferromanganese	Mn Salt	Ferromanganese
Co	"	Co
Ni	"	Ni
Cu	"	Cu
Ag	"	Ag
Cd	"	Cd
Sn	"	Sn
Hg	"	Hg
Bi	"	Bi
Tl	"	Tl

It may be possible that,

Cu KOH Cu (Cu(I) is used) the hot Cup OXYG to Cu_2O or CuO or the other Cup bring prominently OXYG to Cu_2O (or CuO) further the OXYG or there was would have a Thermo Electric Battery

Possibly could use
Kott Solution with the
Oxide of some metal dissolved
therein —

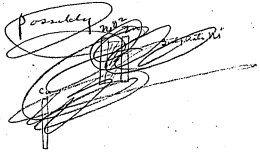


Sb Sn al Si S Li
Cr Mn Zn Ar Selene —
Se & they might not different.

Why can't a dry pile be made of
Zn Cu.

powdered $CuSO_4$ mixed with fine (Compound) sand — it would always remain dry. $ZnSO_4$ taking place of $CuSO_4$ & it could be reversed positely — possibly the Sulphides in $CuSO_4$ (Ores ground) might work as it will absorb $4H_2O$ —

O V E



possibly chilled iron
would work one end chilled
the other not chilled
or a piece norway with chilled
iron poured on it thinner

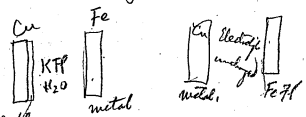
Salts dissolved in KOH, seem to act on electrolysis as if there was no KOH present, if Sulph K is present & Cop Electrodes, SulCu is produced on one Electrode by S Radical but there is immediately decomposed with formation of CuO_2H_2 = This being a general reaction it possibly can be utilized =

Thought and Lelande to dissolve Zinc better,

Pouring alloys phosphides etc both in new moulds to chill & in plaster paris moulds heated nearly to MP of Compound to ~~cool~~ Cool slow to get test on both.

Storage

Instead of storage Gallery
with Iron + Ni —
Where Ni furnishes O to Fe
through $KOH + H_2O$
Why not use —
~~$KOH + H_2O$~~ $KFl + H_2O$
~~or~~ KI or $KCy + H_2O$
with proper metals so Either
Kcy I or Flouri - will act
material of oxygen —



Cufl —
It will be essential to

Use metals which in combining with the combustor are insoluble in the salt of the combustor + water — the radical must not be one with Ox in it, but Halogen, Sulphur etc.

Try some alcohol

Electrolyte.

Chl Zn + Mercuric Chloride dissolve in alcohol

Use a depolarizer whose chloride doesn't dissolve in alcohol

Try Ag alcohol Zn Hcl

Mendeleyeff says

All heavy metals of great atomic wt or high density produce Easy

Contra Lightones –

Class A

Metals which when alloyed with Each other Conduct Electricity in ratios of their Relative Volumes – Lead Tin Zinc Cadmium

Metals which when alloyed with Each other or with a metal of Class A do not Conduct Electricity in ratios of their Relative Volumes but always in a lower degree than that Calculated from the mean of their Volumes Bismuth Aluminum Platinum – Palladium Iron Alum gold Silver Copper

If it be assumed that metals of Class B undergo a molecular change when alloyed with ~~one another~~ another or with metals of Class A & that in each an allotropic change is induced by a small amount of other metals, varying according to the different metals then many of the phenomena characteristic of alloys may be explained

Geo Matthiessen Brit Assn 1863
Report on Chemical & Atomic alloys

He classifies as follows

1st Solid solutions of one metal in another

Pb Sn Cd Sn Zn Sn Pb Cd Zn Cd alloys

2nd Solid solutions of one metal in the allotropic form of another Pb Bi
Sn Bi Sn Cu Zn Cu Pb Ag Ag Sn alloys

3rd Solid Solutions of allotropic modifications of metals in each other.
Bi Au Bi Ag Pd Ag Pt Ag Au Cu
Au Ag alloys—

4th Chemical Compounds of the alloys corresponding to Sn_3Au
Sn_2Au Au^2Sn

5th Solid Solutions of chemical compounds in each other = the alloys intermediate between those corresponding to the above formula

6th Mechanical Mixtures of solidified Solutions of one metal in another = alloys of Pb + Zn containing more than 1.2% Pb or 1.6% Zn

7 Mechanical mixtures of solidified solutions of one metal in the allotropic form of another = alloys of Zn + Bi containing more than 14% of Zn or more than 24% Bi

4th = Mechanical mixtures of solidified solutions of allotropic modifications of the two metals in each other = most of the Ag Cu alloys

---

In accordance with the general rule in regard to chemical combination metals which present the greatest differences in their general chemical characteristics are the most capable of entering in combination with each other & of forming definite compounds. Thus Antimony Arsenic etc which are the most electro positive of the metals form numerous definite compounds with the more electro positive metals = Ag Cu Fe Ni Co etc. Many occur in nature as arsenides, antimonides

Solvent melting

Easily fusible oxides such as lead oxide etc; melted with other less fusible oxides at sufficiently high temp dissolve the latter to a greater or less extent forming saline compounds — Certain sulphides are also dissolved by lead oxide & Bismuth oxide without decomposition forming compounds termed oxysulphides

As a general rule all oxides which are readily fusible like Bi or Sb oxides may be mixed with lead oxide in all proportions by fusion but less fusible oxides yield with PbO difficult fusible mixtures

Iron sesquioxide dis in 4 parts by wt of PbO forming a viscid liquid with 6 pts PbO form a very fusible mixture -

ZnO dissolves in 7 pts PbO form an easily fusible mass

Ferric Ox dissolves in 4 pts of Lead Ox forming a viscid liquid

Cuprous Ox with 1 + half times its wt of PbO form a very liquid compound this probably soluble to a still greater extent

among the sulphides Au Ag & Cu etc do not dis in PbO all the other sulphides are more or less dissolved by it Antimony tri sulphide is especially soluble

---

Alkaline Carbonates dissolve most metallic oxides with sufficient ~~carb~~ alkaline base some of the compounds are easily fusible —

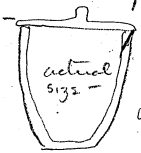
Ferrous ox dis Ferric dont

SnO fuses readily with 5 pts of KCO_3 ZnO less sol — Cu_2O & CuO melt easily with 3 pts KCO_3 PbO mixes all proportions —

Borax dissolves many oxides –
Ferrous O or Ferrous-ferric melted
Equal cons Borax form Crisp at
Crystalline mass ' PbO all proportions'
Manganese O x to considerable Extent

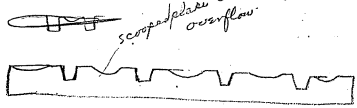
Fluorspar dis 1/2 its wt of
Silica at high temp & does
not combine or dissolve Metallic
oxides –

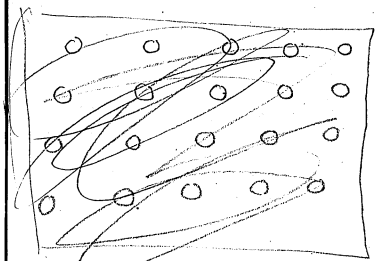
To make the thermo alloys —
use small Hessian or French clay
Crucible — with a lip —

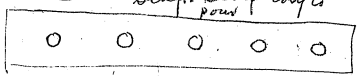


use cover

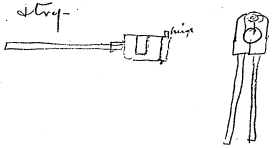
make a fletcher furnace +
have pouring tongs
use 30 grms charge —
add at 1st 100 milgm 2nd 200 3rd
400 4th 700 — 5th 1 grm — after
1 gram Lots till, 100 buttons
made —
Make platinum pasis
button moulder


scoop-pedals in case of an overflow




simple strip Essay to pour

also make some Iron bullet mould & tray -



The Crucible should be covered either with Charcoal or a plug to prevent oxidation -

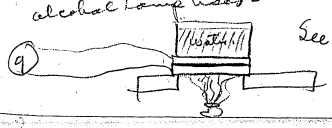
The Portions of Each Run or Crucible Charge should be preserved in Homoopathic Vials & numbered & all put together in one Box with a label - so can always use them & preserve them -

Also Tz if it has res of 64000 times good
greater than Copper - yet 1" 1/32
thick would only have $\frac{1}{100}$ of ohm
its likely that a great many
Chemical Compounds like Magnetite
+ even those which are not Conductors
at all at ordinary temp would
be at 300 @ 350 fahr + with
tubes 6 X 24 [illegible] they might be
invaluable + give enormous voltage
all the oxides could be pressed
in big screw press between
2 plates Copper electroplated
perhaps - 1/8 thick - the oxides
10/000 - + then treated one
side heat other Cold -
anhydrous Chlorides Chromates
Sulphates Nitrides + a host
of Compounds - Borates,
PbO Combined with things, fused
Chlorides alloyed etc -

A Compound having a resistance 10 millions times greater than Copper would if placed between two plates 6" wide + 12" long 10/1000 thick have a resistance of only 2 1/2 ohms and also heat diminishes the res very powerfully it is very possible lots of non decomposable oxides + other Compounds can be made to act as Therms Couples but 100 + 400 Fahr

The probability is that all substances well Conductors, act as Therm. pile

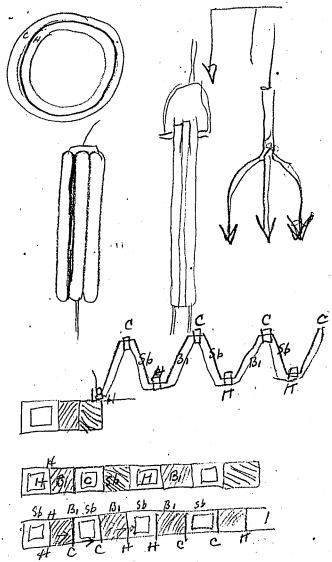
But this one inch square should be used and temps of small alcohol lamp used -



See p 141

On this principle a dry or constant battery might be made
using sheet Zn 20/000 Copper 5/000- with,
1/16 of dry powdered sha Copper - say 10 sheets Cu
10 sheets Zn all pressed together & clamped
possibly al might be used -
possibly some other Salt would
be better than $CuSO_4$ - Double Cy of KCu
The res would be low on account of large
surface -

It may be necessary if the compound
is electrolytic that the plates
should be of the same metal
as the base of the Compound
Zn ZnO Zn — Then the
thermo could be worked by
reversing at times & there
being no polyzn the res wld
be low


C
Sb
H
B1
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B1
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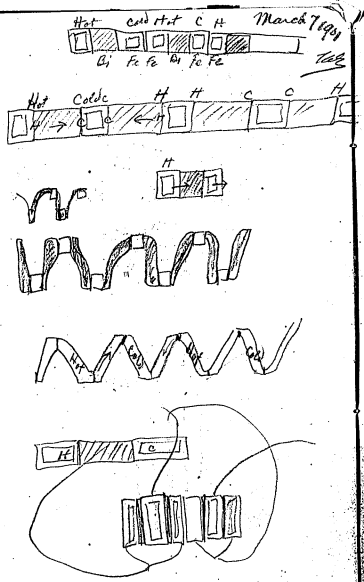
Hot
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Hot
C
H
March 7 1894
Bi
Fe
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Cold
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H
Hot
Cold
Hot
Cold
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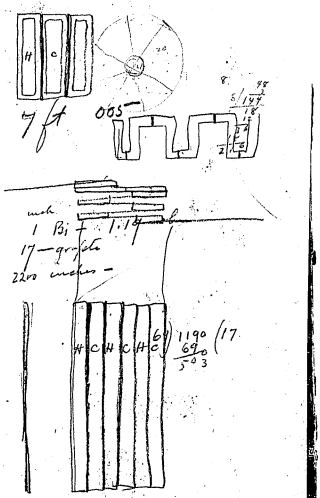
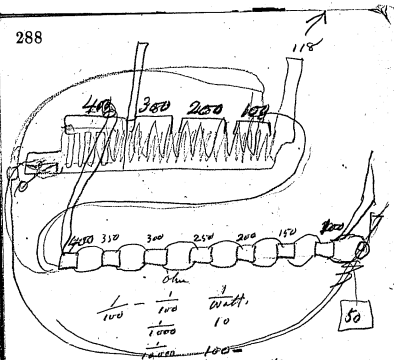
C


H
C
7 ft
005
mch
1 Bi + 1.14
17 — grafite
2200 inches —
H C H C H C
1190
69
503
17



$\frac{1}{100} - \frac{1}{100}$ $\frac{1}{\text{Watt}}$

$\frac{1}{1000}$ 10

~~$\frac{1}{10000}$ 100~~

$\frac{1}{100,000}$ 1000, watt

~~$\frac{1}{1000000}$~~ 10,000 –

~~$\frac{1}{10000000}$~~ 100,000,

800 deg $\frac{1}{10}$ 800 – deg / Watt,

400 $\frac{1}{20}$ 4000 .5

200 $\frac{1}{40}$ 2000 .25

100 1/100 1000 .125

500 .0625

250 0.3125

125 — 0.1562

62 0.078

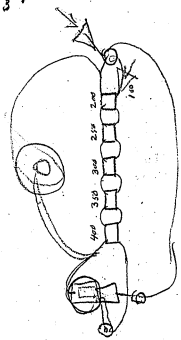
745 / 100 000 (134

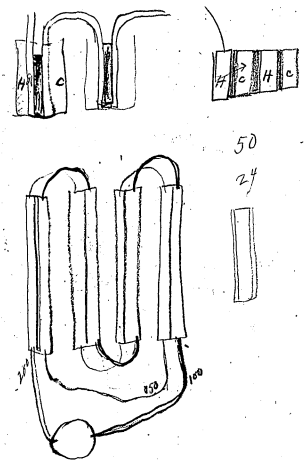
745

2980

2980

3 1 5




H
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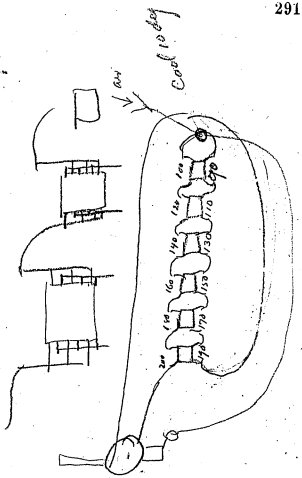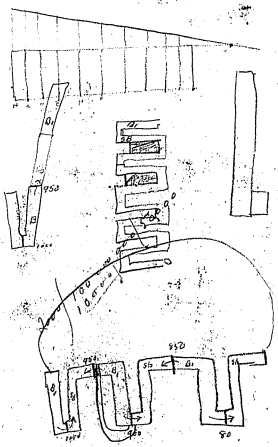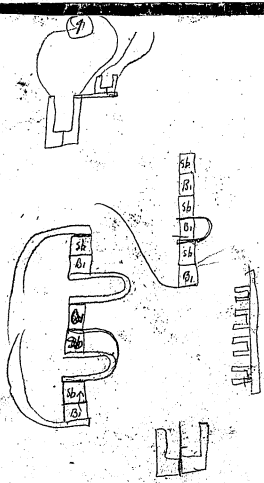
Cool to day
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